

FEDERAL RESERVE BANK OF NEW YORK

CURRENT ISSUES

IN ECONOMICS AND FINANCE

September 1999

Volume 5 Number 13

A Decomposition of the Increased Stability of GDP Growth

Margaret M. McConnell, Patricia C. Mosser, and Gabriel Perez Quiros

Since 1984, the U.S. economy has grown at a remarkably steady pace. An analysis of this increased stability shows that every major component of GDP has exhibited smoother growth. However, two components—inventory investment and consumer spending—are responsible for the bulk of the decline in overall volatility.

Over the last decade and a half, the United States has experienced an unprecedented period of stable economic growth. Indeed, in the period since 1984, the volatility of quarterly real GDP growth has been only half that of the preceding twenty-five years. This pronounced decline in aggregate volatility invites us to take a closer look at the volatility trends within important *components* of real GDP—specifically, consumer spending, residential and business investment, government purchases, and international trade. To what extent has each of these sectors shared in the increased stability of the overall economy?

In this edition of *Current Issues*, we address this question by comparing the volatility of growth exhibited by each component before and after 1984. We also seek to identify those components that contributed the most to the overall drop in growth variability.¹

Our analysis reveals that the growth rates of all the major components of GDP have followed a steadier course, with the most marked reductions in volatility occurring in residential investment and trade. When we weigh each component by its share in overall economic growth, however, inventory investment and consumer spending emerge as the chief contributors to the increased stability of the economy since 1984. Because inventory investment's share of GDP is very small, the important role played by this component is particularly striking.

We also examine the composition of the more stable economy across the stages of the business cycle. We find that the growth of GDP and its components has been smoother in both recessions and expansions. Thus, the drop in volatility cannot be attributed solely to a simple decline in the number and severity of recessions in recent years.

Two Types of Explanations

Increased stability in the growth of aggregate GDP and its individual components may reflect two broad types of changes in the economic environment since the early 1980s. First, structural changes—such as technological innovations and regulatory shifts—may have helped smooth economic fluctuations in some sectors. Indeed, in the early 1980s, many structural changes were under way that may have improved certain sectors' ability to respond to changes in demand and to absorb economic shocks. These improvements, in turn, could have led to more stable growth.

The second type of explanation—while potentially important—goes far beyond the scope of the simple decomposition analysis presented here. This explanation relates to the role of monetary policy and economic shocks in the variability of economic growth. It is possible that a stabilizing monetary policy and smaller economic shocks—“good policy and good luck”—may have played a role in the decline of overall volatility.² While this

second explanation clearly deserves further research, we focus our analysis solely on possible structural explanations for the more stable growth.

The Decline in the Volatility of GDP Growth

A glance at the path of real GDP growth in recent decades suggests that volatility dropped markedly not long after the 1981-82 recession (Chart 1). Employing advanced statistical techniques, McConnell and Perez Quiros (1998) identify the date of the volatility drop in GDP growth as the first quarter of 1984. In our analysis, we use this date to split our sample into two periods: 1959-83 and 1984-98. When we calculate the volatility of GDP growth—measured by the standard deviation of quarterly growth rates—for each of the two periods, we find a significant 2.2 percentage point drop from the first period to the second.³

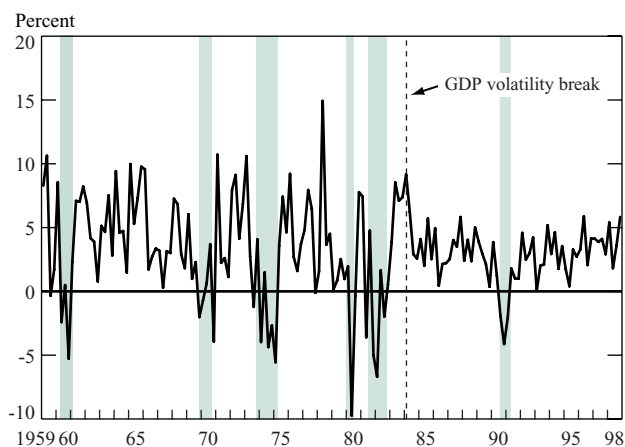
Similar calculations for the growth rates of the major components of GDP show that all have become less volatile in the later period (Table 1). Residential investment, exports, and imports experienced the largest absolute declines in growth volatility, while federal government purchases and consumer spending experienced the smallest reductions in volatility. The fact that growth patterns in each of the major components of GDP reflected the decline in aggregate volatility is not surprising. Income and spending patterns in a particular sector often depend to some extent on developments in other sectors. Thus, greater stability in one component of GDP likely reflects more stable growth in other areas. We do not, however, attempt to separate out these

spillover effects in our analysis. Instead, we seek clues about the underlying sources of more stable growth by focusing on those components that experienced the largest reductions in growth variability.

We look first at residential investment. The size of quarterly fluctuations in the growth of this component has shrunk significantly—from an average of 23.9 percent in 1959-83 to 11.6 percent in 1984-98 (Chart 2). Regulatory and structural changes in the 1980s very likely contributed to the sector's stability, largely by enabling banks and other financial institutions to stabilize the supply of funds for housing investment. For example, the federal government's elimination of the interest rate ceilings imposed on bank deposits by Regulation Q curbed the outflow of funds from banks during periods of high or rising rates and helped ensure that these institutions would have the means to continue their mortgage lending.⁴ In addition, the development of the market for mortgage-backed securities and the increased use of interest rate swaps permitted banks and other financial institutions to better hedge their exposure to changes in interest rates. In turn, the lowering of interest rate risk may have allowed these institutions to offer a more stable supply of funds for housing investment.

Growth in both imports and exports also exhibited a striking decline in volatility. The gradual breakdown of trading barriers around the world over the past twenty years is one possible explanation for the decrease in trade volatility. For example, the General Agreement on Tariffs and Trade and other international agreements

Chart 1
Real Gross Domestic Product
Annualized Quarterly Growth Rates



Source: U.S. Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts.

Note: The shaded areas denote periods designated recessions by the National Bureau of Economic Research.

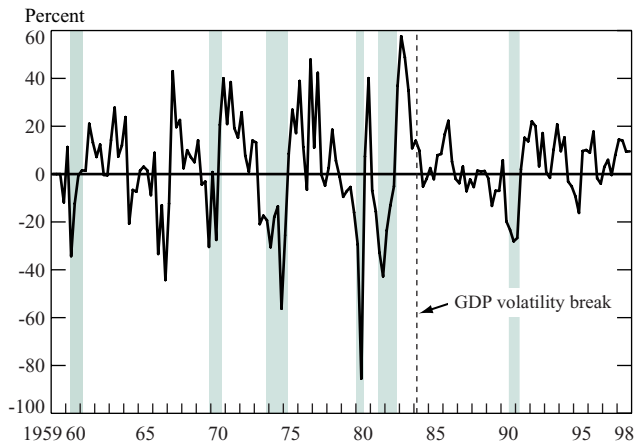
Table 1
Volatility of Growth in Real GDP and Its Components
Standard Deviations of Annualized Quarterly Growth Rates

	Standard Deviation		Difference
	1959-83	1984-98	
GDP	4.4	2.2	-2.2
Consumer spending			
Goods	4.7	3.8	-0.9
Services	1.9	1.5	-0.4
Investment ^a			
Residential	23.9	11.6	-12.3
Business fixed	10.0	7.9	-2.1
Government purchases			
Federal	7.5	7.2	-0.3
State and local	4.1	2.1	-2.0
Net exports			
Exports	18.8	7.7	-11.1
Imports	17.8	7.8	-10.0

Source: Authors' calculations, based on U.S. Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts.

^aExcludes inventory investment. Growth rates cannot be calculated for inventory investment because levels of this subcomponent are sometimes negative.

Chart 2
Real Residential Investment
 Annualized Quarterly Growth Rates



Source: U.S. Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts.

Note: The shaded areas denote periods designated recessions by the National Bureau of Economic Research.

have eliminated many barriers to the trade of manufactured goods. With more markets open to U.S. goods, firms here can minimize risk and achieve steadier growth by exporting their products to a broad range of countries.

Changes in the composition of trade may also have helped increase stability in trade. U.S. import growth may be smoother because import shares of relatively volatile commodities such as food, petroleum, and industrial materials have fallen significantly in the last fifteen years. At the same time, services—which tend to grow at a less variable rate than goods—have accounted for an increasingly large share of total U.S. exports since the early 1980s.

In contrast to growth in housing investment and trade, growth in consumer spending was only slightly less volatile in the second period than in the first. The size of quarterly fluctuations in consumer spending growth fell from an average of 3.3 percent in 1959-83 to 2.1 percent in 1984-98. As we note below, however, the large size of this component relative to aggregate GDP makes even a small decline noteworthy. Some analysts have attributed the volatility decline in this component to a shift away from the consumption of goods toward the consumption of services. To be sure, spending on consumer services tends to be less volatile than spending on household goods (particularly consumer durables). Our results, however, show that growth variability dropped in both categories of spending and that the decrease for goods was large relative to that for services (Table 1). Thus, a shift toward spending on services is at best a partial

explanation for the more stable growth in overall consumer spending.⁵ Moreover, of all the GDP components, consumer spending has likely benefited the most from the spillover effects of increased stability in other parts of the economy. In particular, reduced volatility in all categories of GDP tends to lead to steadier growth in income and, consequently, in household spending.

Growth Contributions and the Decline in Volatility

So far we have explored the changes in the volatility of growth rates for the individual components of GDP. We now assess the extent to which these changes have helped bring about the increased stability of aggregate growth. To do so, we calculate the volatility of each component's contribution to real GDP growth. This "growth contribution" is, roughly speaking, the real growth rate of the component multiplied by the component's share of total GDP.⁶ Unlike growth rates, growth contributions take into account the size of each component relative to GDP and provide a convenient measure for "adding up" the components of output growth. The volatility of each component's growth contribution over the two sample periods gives us our measure of that component's contribution to the decline in aggregate volatility.⁷ Significantly, we can obtain such measures for two components of GDP for which growth rates cannot be calculated—inventory investment (a subcomponent of investment) and net exports.

Our calculations reveal that the most important contributor to the overall reduction in the variability of aggregate GDP growth is inventory investment (Table 2).⁸ As the table shows, the volatility of inventory investment's growth contribution fell from an average of 2.9 percent in the 1959-83 period to 1.7 percent in the 1984-98 period. Inventory investment's large contribution to the increase in the stability of aggregate GDP growth is striking: this component accounts for just 1 percent of total output. Despite its small role in overall economic activity, the component has historically contributed the greatest degree of volatility to growth in GDP.

The reduction in the volatility of inventory investment's growth contribution was particularly important during the most recent recession. In the recessions that took place during the 1959-83 period, declines in inventory investment accounted for almost the entire drop in real output. In the 1990-91 recession, however, inventory investment accounted for only about a third of the peak-to-trough decline in real GDP.

Why has the variability in this segment of the economy experienced such a steep decline in recent years? One explanation may be that during the 1980s, companies in the manufacturing sector implemented

Table 2
Volatility of GDP Components' Growth Contributions

Standard Deviations of Annualized Quarterly Growth Contributions

	Standard Deviation		Difference
	1959-83	1984-98	
Consumer spending	2.5	1.4	-1.1
Investment			
Residential	1.1	0.5	-0.6
Business fixed	1.3	0.9	-0.4
Inventory investment	2.9	1.7	-1.2
Government purchases			
Federal	0.9	0.6	-0.3
State and local	0.6	0.2	-0.4
Net exports	1.3	1.0	-0.3
Exports	1.1	0.8	-0.3
Imports	1.2	0.9	-0.3

Source: Authors' calculations, based on U.S. Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts.

Note: Data are standard deviations of growth contributions; they do not sum to the standard deviation in GDP growth.

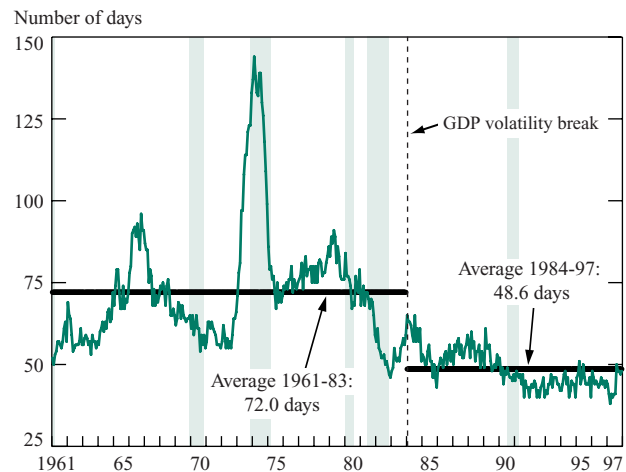
large-scale structural changes in inventory management. Many of these changes—including the move to “just-in-time” computer-based inventory management and ordering systems—may have had the effect of smoothing inventory investment by reducing both the average level and the variability of inventory stocks relative to demand.

Consider, for example, the adoption of just-in-time ordering methods. A monthly survey conducted by the National Association of Purchasing Managers shows that firms have significantly reduced the number of days in advance of production that they order their materials and supplies. The average lead time from January 1961 to December 1983 was seventy-two days; this figure dropped to forty-nine days for the 1984-97 period (Chart 3). By purchasing materials much closer to the actual date of production, firms can react more quickly to unexpected shifts in demand and thus avoid extreme fluctuations in inventories.⁹

Aggregate data on inventory investment provide evidence that the structural changes undertaken in the early 1980s have helped companies to both reduce their investment in inventories and stabilize their inventories relative to demand. The mean of inventory investment as a share of final sales was lower in 1984-98 than in 1959-83. The variability of the inventory-to-sales ratio also declined from the earlier to the later period.

Consumer spending is the next largest contributor to the increase in stability—the volatility of this component's growth contribution fell from an average of 2.5 percent to 1.4 percent. This finding is less surprising than our results for inventory investment. Because

Chart 3
Average Lead Time for Ordering Production Materials



Source: National Association of Purchasing Managers.

Note: The shaded areas denote periods designated recessions by the National Bureau of Economic Research.

consumption accounts for almost two-thirds of aggregate GDP, even relatively modest declines in volatility can significantly quell overall volatility.

The other GDP components that experienced large outright declines in the volatility of growth contributed much less to the stability apparent in aggregate GDP over the 1984-98 period. The residential investment sector accounts for only about 5 percent of economic output. Thus, the decline in the volatility of its growth contribution was relatively small even though the variability of its growth rate fell sharply. The same is true for exports, which account for just 10 percent of real aggregate GDP, and imports, which account for 11 percent of GDP.

Growth Variability across the Business Cycle

From 1984 to 1998, the United States experienced one mild recession, from third-quarter 1990 through first-quarter 1991. By contrast, over the preceding twenty-five years, the economy underwent five recessions; two of those downturns—1973-75 and 1981-82—were relatively severe. Not surprisingly, an argument has been made that the decline in the volatility of aggregate GDP growth can be attributed almost entirely to the lack of protracted recessions in the later period. But if the absence of recessions is in fact the reason for steadier growth, we would expect GDP growth during 1984-98 expansions to show roughly the same degree of volatility as in earlier expansions. To determine if this is the case, we eliminate recessions from our analysis and recalculate the volatility of GDP growth for the two sample periods. Our results show that the standard

Table 3
Volatility of GDP Components' Growth Contributions during Expansions

Standard Deviations of Annualized Quarterly Growth Contributions

	Standard Deviation		Difference
	1959-83	1984-98	
GDP	3.5	1.8	-1.7
Consumer spending	2.2	1.2	-1.0
Investment			
Residential	0.9	0.4	-0.5
Business fixed	1.3	0.9	-0.4
Inventory investment	2.6	1.7	-0.9
Government purchases			
Federal	0.9	0.6	-0.3
State and local	0.6	0.2	-0.4
Net exports	1.2	1.0	-0.2
Exports	1.2	0.8	-0.4
Imports	1.1	0.8	-0.3

Source: Authors' calculations, based on U.S. Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts.

Notes: Data are standard deviations of growth contributions; they do not sum to the standard deviation in GDP growth. Economic expansions are all quarters between 1959 and 1998 except periods designated recessions by the National Bureau of Economic Research. If we exclude the two quarters before and after each recession, we obtain qualitatively similar results.

deviation of real quarterly GDP growth fell substantially during expansions alone—from 3.5 percent in the 1959-83 period to 1.8 percent in the 1984-98 period.

By removing recessions from our analysis, we might also expect to see a change in the relative contributions of different GDP components to the decline in volatility (Table 3). For example, we know that changes in inventory investment have historically accounted for a large portion of the fluctuations in GDP during recessions. Consequently, if we discount the recessions, the role of inventory investment in bringing about smoother GDP growth might prove much smaller. We find, however, that while the decline in the volatility of this component's growth contribution shrinks somewhat, inventory investment remains one of the two most important contributors to the increased stability of growth. Overall, the pattern observed during expansions closely mirrors that observed for the 1959-98 period: the variability of the growth contributions of all major GDP components declined after the early 1980s.

Conclusion

In this edition of *Current Issues*, we have examined changes in the volatility of growth in the major components of aggregate GDP since the early 1980s. We have shown that the growth rates of all the components became less volatile after 1983, with residential investment and trade experiencing the largest decreases. Data

on the growth contributions of the GDP components, however, indicate that two components—inventory investment and consumer spending—were particularly important in accounting for the overall decline in volatility. Moreover, the analysis shows that the volatility break is evident in both economic expansions and recessions. This finding suggests that the increase in the stability of growth cannot be attributed solely to the mildness of the 1990-91 downturn.

The composition of the variability of growth gives some clues to the causes and consequences of the less volatile economy. Our decomposition suggests that structural, regulatory, and institutional changes over the past fifteen to twenty years have contributed to lower volatility in several sectors—housing investment, trade, and most notably, inventory investment. These changes could have promoted stability by muting the way economic shocks and policy changes are transmitted through various sectors. As we have seen, regulatory change and financial market innovation may have helped ease the sensitivity of housing investment to changes in interest rates; trade liberalization may have opened up new markets and insulated U.S. exporters against sudden changes in demand from existing customers; and inventory management reforms may have enabled U.S. manufacturers to adjust more quickly and flexibly to shifts in demand.

Is the less volatile growth in GDP and its components likely to continue? If a stabilizing monetary policy and smaller economic shocks—developments not explored here—largely explain the steadier growth in GDP, then the recent period of stability may continue only as long as “good policy and good luck” last. By contrast, if structural changes—including those discussed above—have muted the transmission of policy shifts and economic shocks through the economy, then the increased stability we have experienced since 1984 may become a permanent feature of U.S. economic growth.

Notes

1. A number of recent studies have explored the increased stability of the U.S. economy. McConnell and Perez Quiros (1998) estimate a break in growth variability in the first quarter of 1984 and attribute the break to a reduction in the share of durable goods output accounted for by inventory investment. Clarida, Gali, and Gertler (1998) investigate how monetary policy may affect stability, and Filardo (1997) examines whether the decline in manufacturing and the rise in services may have contributed to increased stability.

In addition, the business press has reported on the increased stability of the U.S. economy. See, for example, “Those Vicious Business Cycles, Tamed but Not Quite Slain,” *New York Times*, January 2, 1997.

2. For example, the economy has not experienced a large, sustained negative supply shock since the oil price increases of the 1970s. In

addition, inflation since 1984 has been generally stable or declining (except for 1988), and monetary policy—at least as measured by short-term interest rates—has been more stable than during the previous twenty-five years.

3. In this article, the volatility of growth is measured as the standard deviation of quarterly growth rates over a particular time period. The standard deviation of growth—which is measured in percentage points—is the square root of the variance of growth. The variance of growth is the average of the squared deviations of individual quarterly growth rates from the average growth rate over a particular time period.

4. Before this change took effect, a rise in market interest rates above the Regulation Q ceilings (triggered, for example, by a tightening of monetary policy) would prompt corporations and others to move their funds out of low-yielding bank deposits and into assets offering a higher rate of return. As a result, banks and other financial intermediaries experienced a sharp reduction in the funds available for mortgage lending, and housing activity declined accordingly. Several studies (including Ryding 1990 and Throop 1986) have shown that the elimination of interest rate ceilings has reduced the sensitivity of housing investment to changes in interest rates and monetary policy.

5. Our skeptical assessment of the effects of the shift to a services economy is consistent with Filardo (1997). Filardo concludes that this shift has had little impact on the business cycle. He emphasizes that while employment in manufacturing as a share of total employment has fallen in recent years, productivity gains in manufacturing have kept the sector's share of total output relatively stable.

6. For details on how the Bureau of Economic Analysis (BEA) calculates chain-weighted growth contributions, see Seskin and Parker (1998). The BEA's calculation of growth contributions for chain-weighted estimates of real GDP is more complicated than our simple description would suggest. It requires appropriate weighting based on the "chained" weights for different output components in a particular period. By definition, the sum of the growth contributions for real consumer spending, business and residential investment, government consumption and investment, and net exports must be equal to the growth rate of real GDP.

7. Covariances between the growth contributions of individual components also contribute to aggregate growth volatility. For the GDP components, changes in the covariances of growth contributions were in line with their volatility changes.

8. Using more rigorous tests for structural breaks in a time series, McConnell and Perez Quiros (1998) conclude that inventory investment is the only component of real GDP growth that experienced a statistically significant decline in volatility after 1984.

9. We focus here on the effect of changes in inventory holdings on quarter-to-quarter fluctuations in GDP. Other researchers have examined whether changes in inventory management have affected the business cycle. For example, see Bechter and Stanley (1993), Filardo (1995), and Morgan (1991).

References

- Bechter, D., and S. Stanley. 1993. "Economic Stability in the 1990s: The Implications of Improved Inventory Control." Federal Reserve Bank of Richmond *Business Economics*, January: 35-8.
- Clarida, R., J. Gali, and M. Gertler. 1998. "Monetary Policy Rules and Macroeconomic Stability: Evidence and Some Theory." NBER Working Paper no. 6442. Forthcoming in *The Quarterly Journal of Economics*.
- Filardo, Andrew J. 1995. "Recent Evidence on the Muted Inventory Cycles." Federal Reserve Bank of Kansas City *Economic Review* 80, no. 2: 25-43.
- . 1997. "Cyclical Implications of the Declining Manufacturing Employment Share." Federal Reserve Bank of Kansas City *Economic Review* 82, no. 2: 63-87.
- McConnell, M., and G. Perez Quiros. 1998. "Output Fluctuations in the United States: What Has Changed since the Early 1980s?" Federal Reserve Bank of New York *Staff Reports*, no. 41.
- Morgan, Donald. 1991. "Will Just-in-Time Inventory Techniques Dampen Recessions?" Federal Reserve Bank of Kansas City *Economic Review*, March-April: 21-33.
- Ryding, John. 1990. "Housing Finance and the Transmission of Monetary Policy." Federal Reserve Bank of New York *Quarterly Review* 15, no. 2 (summer): 42-55.
- Seskin, E. P., and R. P. Parker. 1998. "A Guide to the NIPAs." *Survey of Current Business*. U.S. Department of Commerce, Bureau of Economic Analysis, March.
- Throop, Adrian. 1986. "Financial Deregulation, Interest Rates and the Housing Cycle." Federal Reserve Bank of San Francisco *Economic Review*, summer: 63-78.

About the Authors

Margaret M. McConnell is an economist in the Domestic Research Function; Patricia C. Mosser is an assistant vice president in the Capital Markets Function. Gabriel Perez Quiros, formerly an economist in the Domestic Research Function, is currently an economist at the European Central Bank.

The views expressed in this article are those of the authors and do not necessarily reflect the position of the Federal Reserve Bank of New York or the Federal Reserve System.

Current Issues in Economics and Finance is published by the Research and Market Analysis Group of the Federal Reserve Bank of New York. Dorothy Meadow Sobol is the editor.
